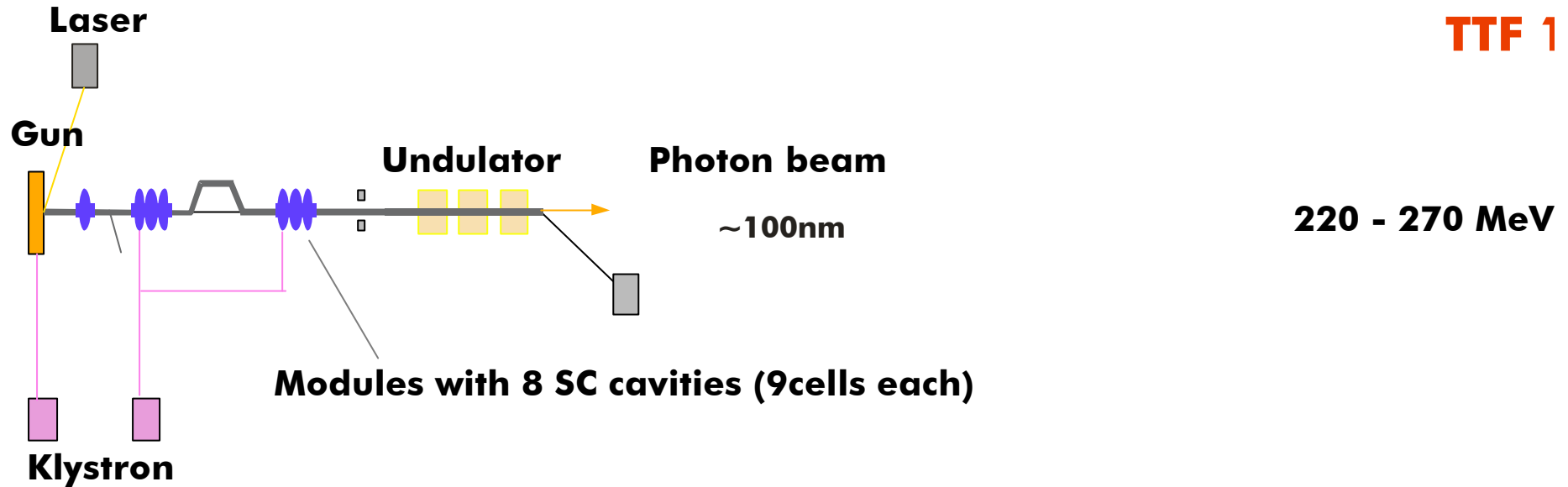# GAN @ TESLA Test Facility
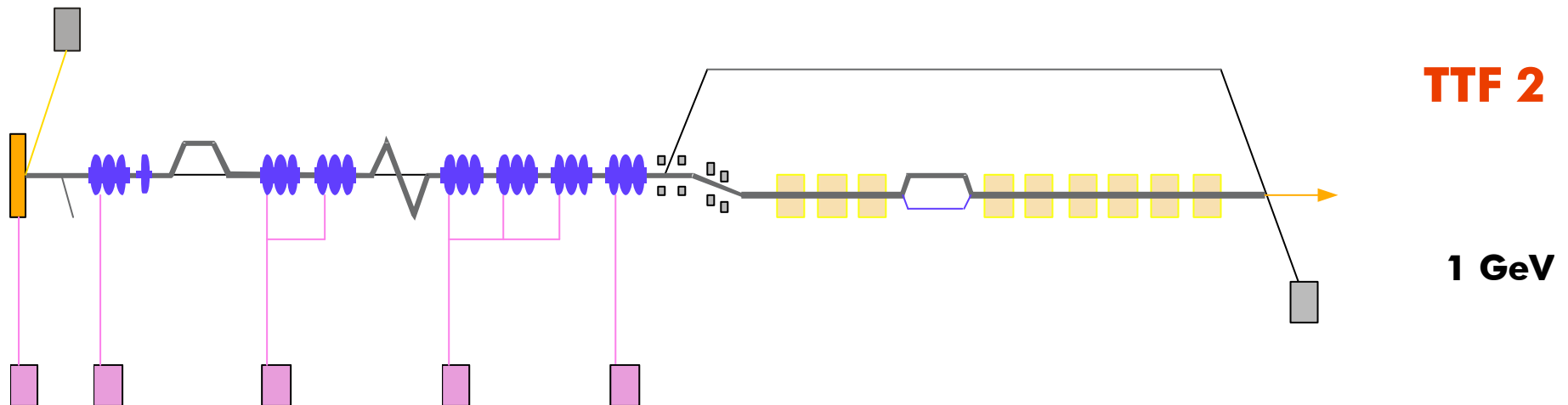
Kay Rehlich, DESY MVP

- **TTF Overview**

- **Remote Operations @ TTF**

- **Possible GAN Activities @ TTF**

- **Conclusions/Outlook**

Laser

Gun

Undulator   **Photon beam**

~100nm

220 - 270 MeV

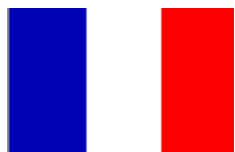**Modules with 8 SC cavities (9cells each)**

Klystron

1 GeV

Yerevan Physics Institute

**IHEP, BeijingTsinghua University**

Institute of Physics, Helsinki

DSM/DAPNIA, Saclay
IN2P3/IPN, Orsay
IN2P3/LAL, Orsay

BESSY, Berlin
DESY, Hamburg
Frankfurt University
FZ Karlsruhe
GKSS Research Centre
Hahn-Meitner-Institut Berlin
Hamburg University
Max Born Institute, Berlin
Rostock University
RWTH, Aachen
TU, Berlin
TU, Darmstadt
TU, Dresden
Wuppertal University
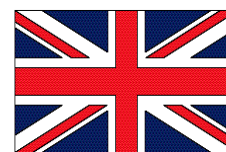
CCLRC, Daresbury & Rutherford Appleton

INFN, Frascati
INFN, Legnaro
INFN, Milano
Univ.Roma II

BINP, Novosibirsk
BINP, Protvino
IHEP, Protvino
INR, Troitsk
**JINR Dubna**
MEPhI, Moscow
ITEP, Moscow

DMCS Technical University, Lodz Faculty of Physics Warsaw University
High Pressure Reaserch Center "UNIPRESS" PAS, Warsaw
Inst. of Nuclear Physics, Cracow
Inst. of Physics Polish Acad. of Science, Warsaw
ISE Technical University, Warsaw
Polish Atomic Energy Agency, Warsaw
Soltan Inst. for Nuclear Studies, Otwock-Swierk
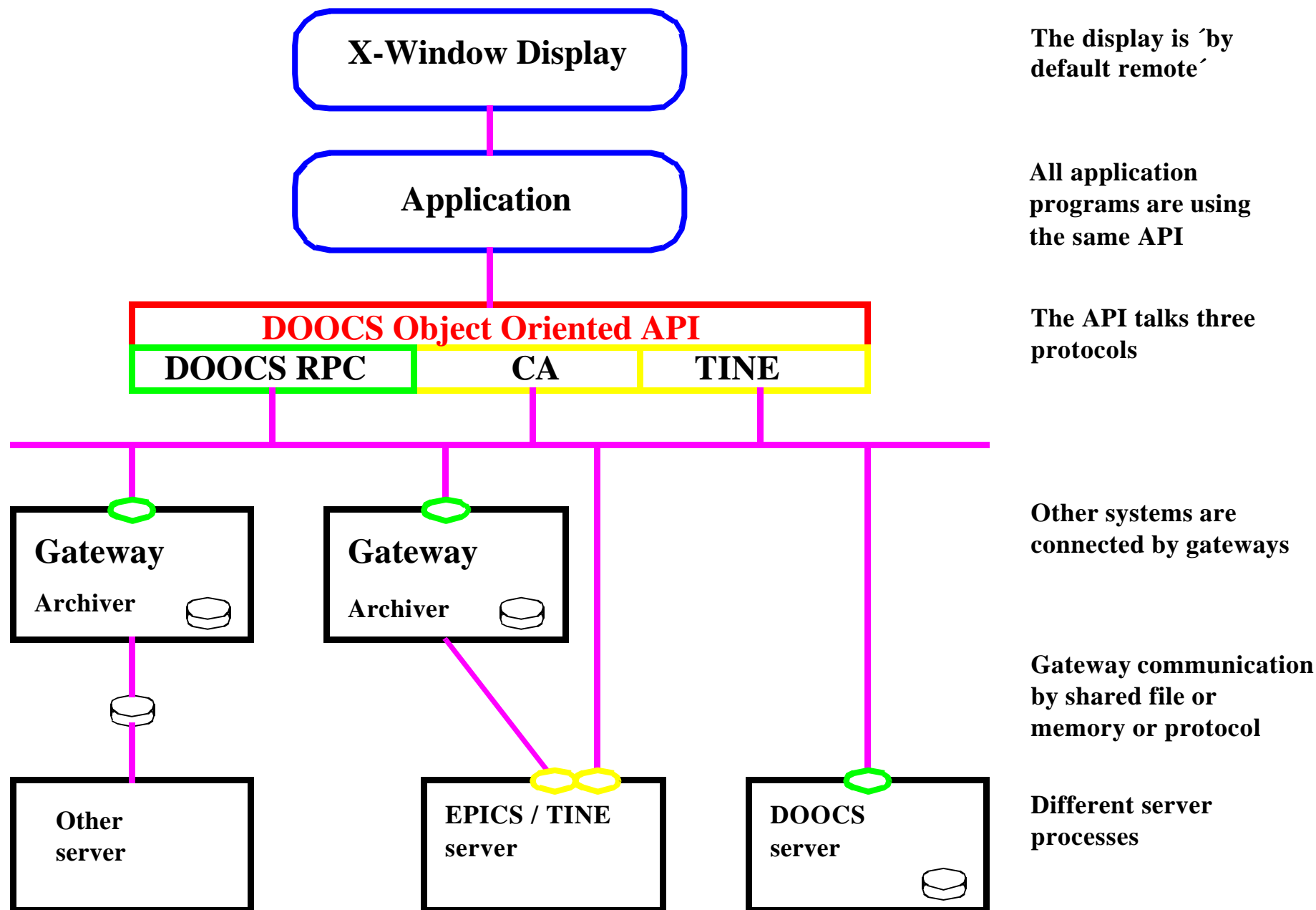**Univ. of Mining & Metallurgy, Cracow**

APS/Argonne, Chicago, IL
Cornell University, Ithaca, NY
Fermilab, Batavia, IL
Thomas Jefferson National Laboratory, Newport News, VA
UCLA Dep.of Physics, Los Angeles, LA
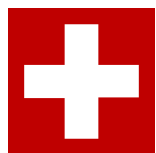
Paul Scherrer Institut, Villingen

- **Contributions with different control systems**

  - **Klystrons: FNAL ('Classic Protocol')**

  - **Injector: Orsay/Saclay (EPICS)**

  - **Screens/OTR: INFN (Mac with shared memory)**

  - **Laser: Max Born (shared memory)**

  - **Wire alignment: INFN (file sharing)**

  - **Beam loss: HMI (file sharing)**

  - **Magnets: DESY (TINE)**

- **DOOCS is the integrating part**

TTF Control System

X-Window Display

The display is ´by default remote´

Application

All application programs are using the same API

DOOCS Object Oriented API

The API talks three protocols

DOOCS RPC	CA	TINE

Gateway

Archiver

Gateway

Archiver

Other systems are connected by gateways

Gateway communication by shared file or memory or protocol

Other server

EPICS / TINE server

DOOCS server

Different server processes

- **Distributed Object Oriented Control System (DOOCS)**
  design idea:

  - devices and data properties defined in objects

  - object oriented C++ libraries

  - most functions in device and middle layer servers

  - OO API for all programs to access all data of TTF

  - modular and scalable

  - online configuration

  - automated procedures in middle layer

  - access authorization at server

  - runs on UNIX (X-Windows)

- TTF has now two control rooms at DESY

    - all data points are available in the control system

    - scope and camera images are available with Netscape

    - ==> second control room was no problem

- remote maintenance from Paris (several years)

- remote shifts from Milano (INFN)

- measurements at Fermilab (A0) and Berlin (PITZ)

- network security (fire wall, SSH)

- machine protection system (interlock system)

- access to all devices (diagnostics .. reset buttons)

- integrated environment on one computer platform

- some level of automation

- operator training

- e-logbook

- video conferencing (shift and meetings)

- it works

- a bit slower than local (but okay)

- good and long experience with remote maintenance

- all devices are remote controllable

- 'Netmeeting' audio quality is bad -> need better tool

- video conferencing of shift turnover meetings is missing

- e-LogBook is a must for remote operations

- involves more people in the machine operations

- allows experts to give comments, hints or warnings

- search function helps a lot

- common place for all measurement results

- good information source for the management

- has limitations for long term info since it is shift based

➡ e-LogBook is an important GAN tool

Communication:
video/audio
e-logbook ...

Information:
diagrams
manuals
specs
to do lists ...

local operations crew

Control System

Operation

remote operations crew

experts, designers, managers ..

User
Display

local or remote

ROOT *

DOOCS
Tools

Web
Browser *

DAQ *

Middle
Layer
Server

Web
Server *

Web
Server *

Device
Server

* possible GAN activities

TTF   World
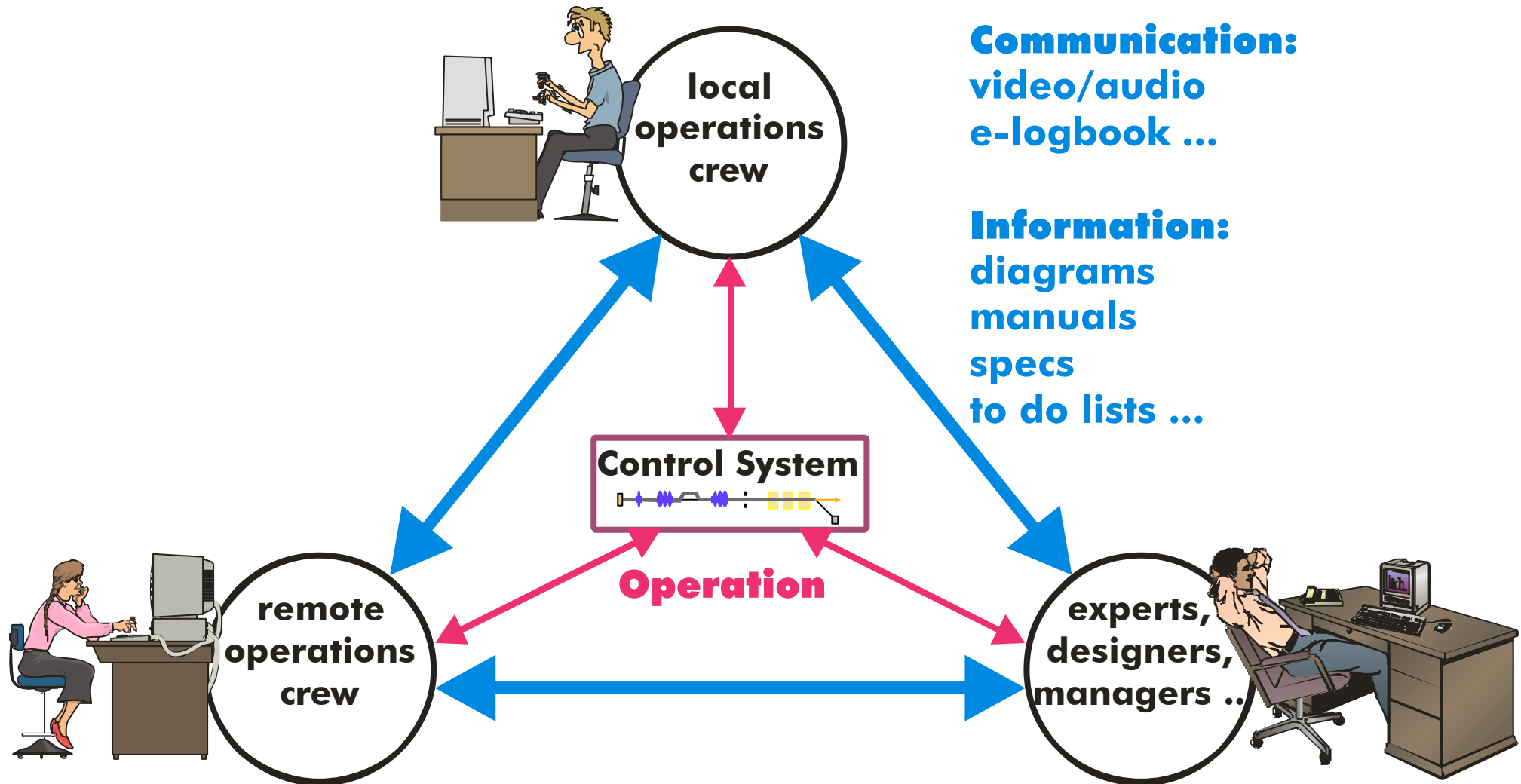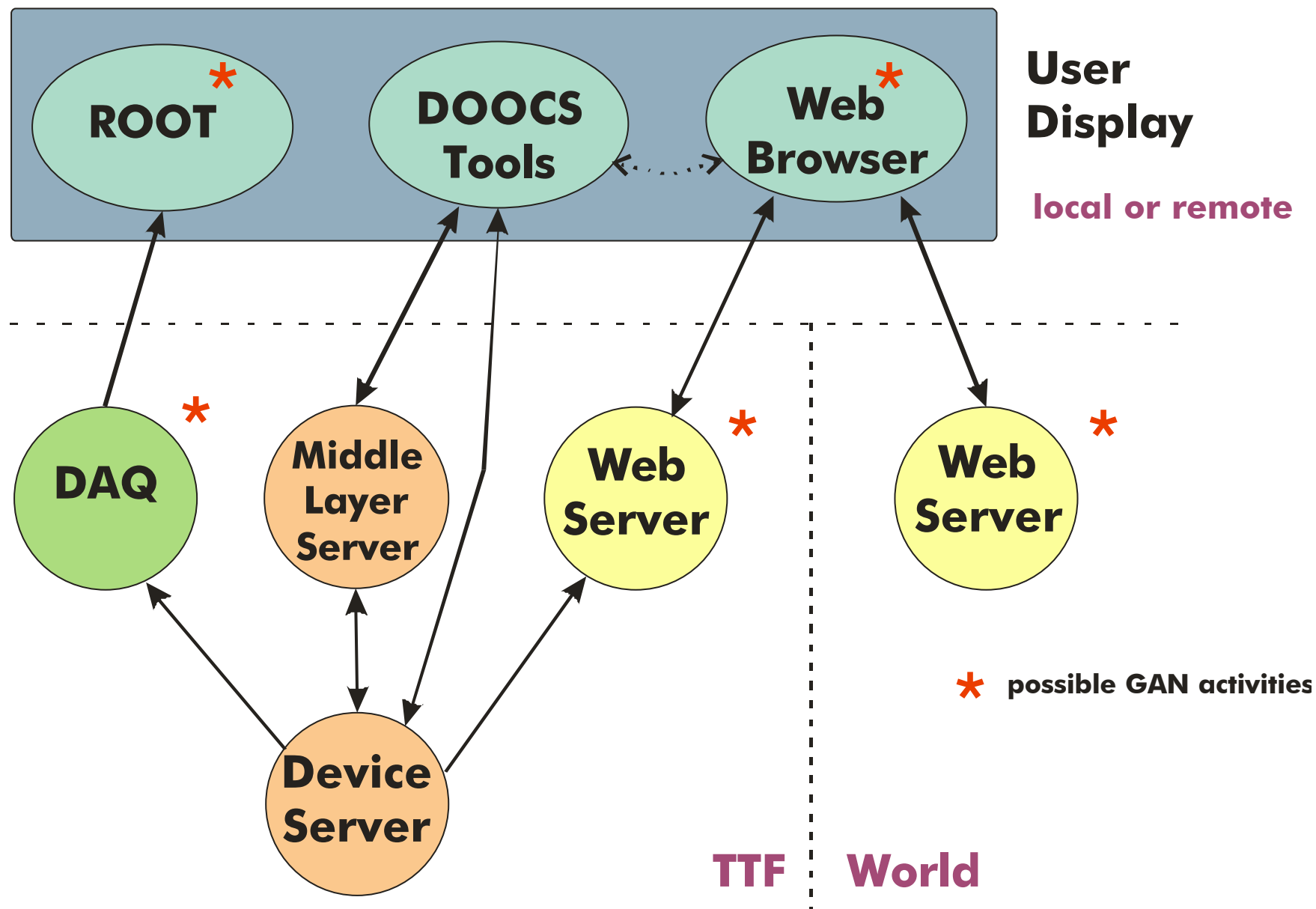
- **TTF constrains**

    operation of TTF 2 must start middle 2003, core system is defined

1. **Add-ons to the control system**

    Data Acquisition system (DAQ)

2. **Web based tools for TTF and GAN**

    video conferencing system (shifts and meetings)

    e-logbook development

    ...

3. **Web based tools for collaborative work**

    for communications, documentation, shared development ...

4. **Remote operations and measurements**

    machine shifts (with or without local crew)

    maintenance, improvements

1

- **The goal is to better understand, improve and maintain the linac**
  FEL operation has very high requirements on the subsystems

  - error statistics: find reasons of faults, improve reliability of subsystems

  - operation optimizations, find best parameters

  - allow experiments to correlate measurements with the machine

- **Record all beam relevant data of the linac**

- **Will be developed in collaboration with Cornell/Ohio State**

  - **GAN-involved development (use GAN tools)**

DAQ Architecture for TTF2   (draft)
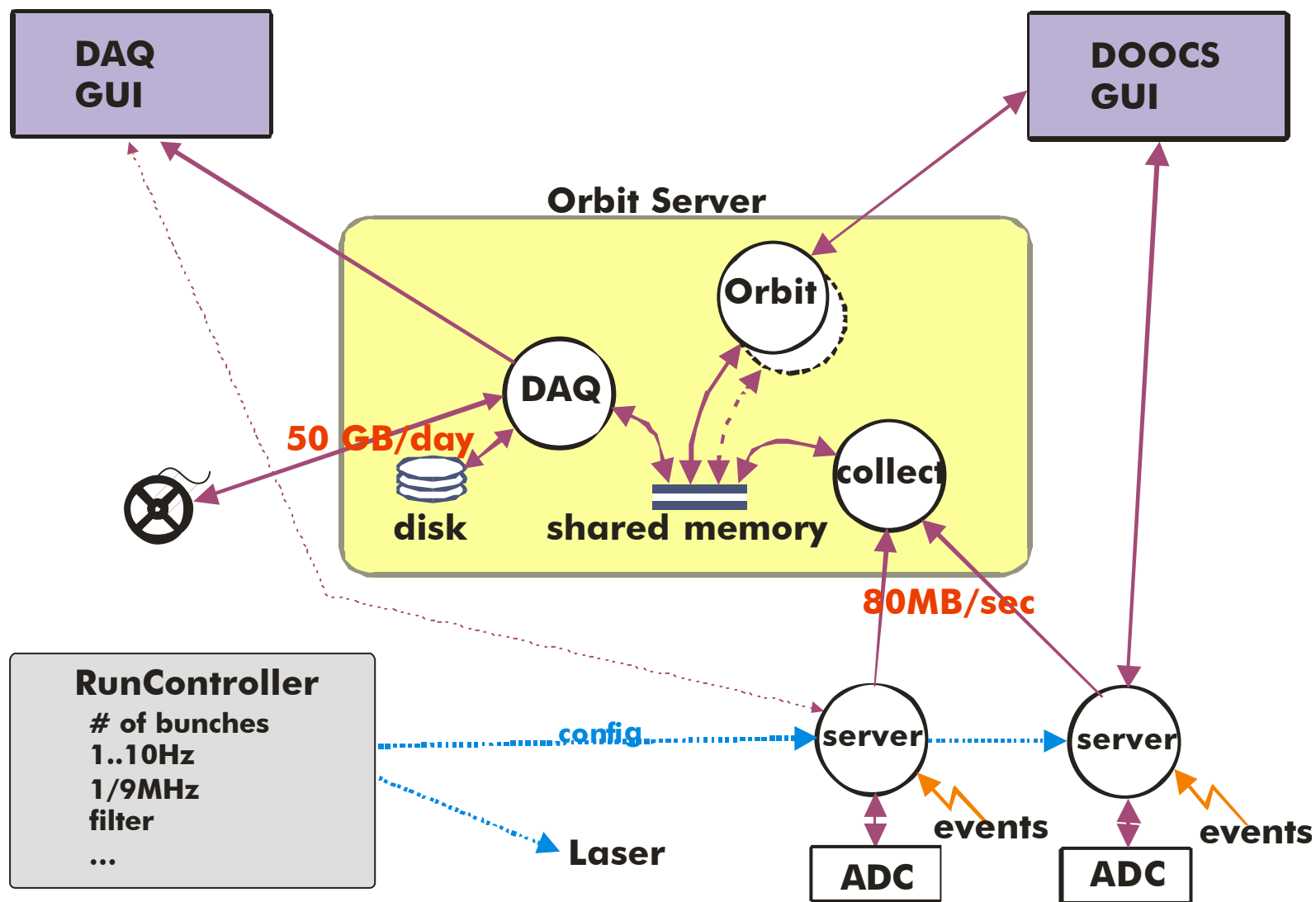
2

- video conferencing system (urgent)

  - for common remote shifts

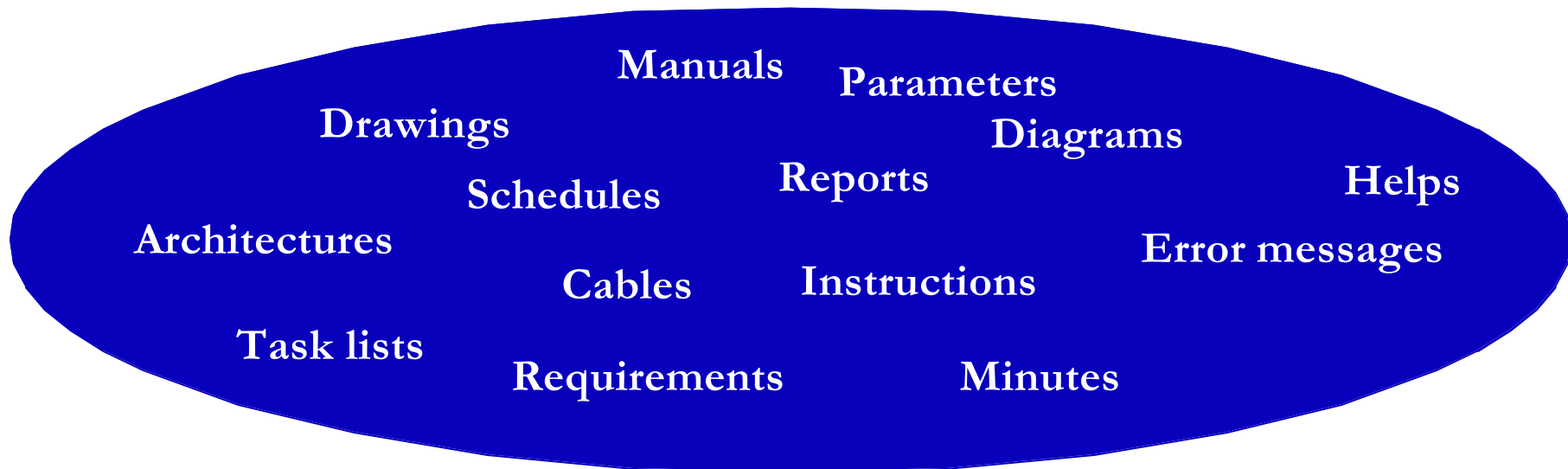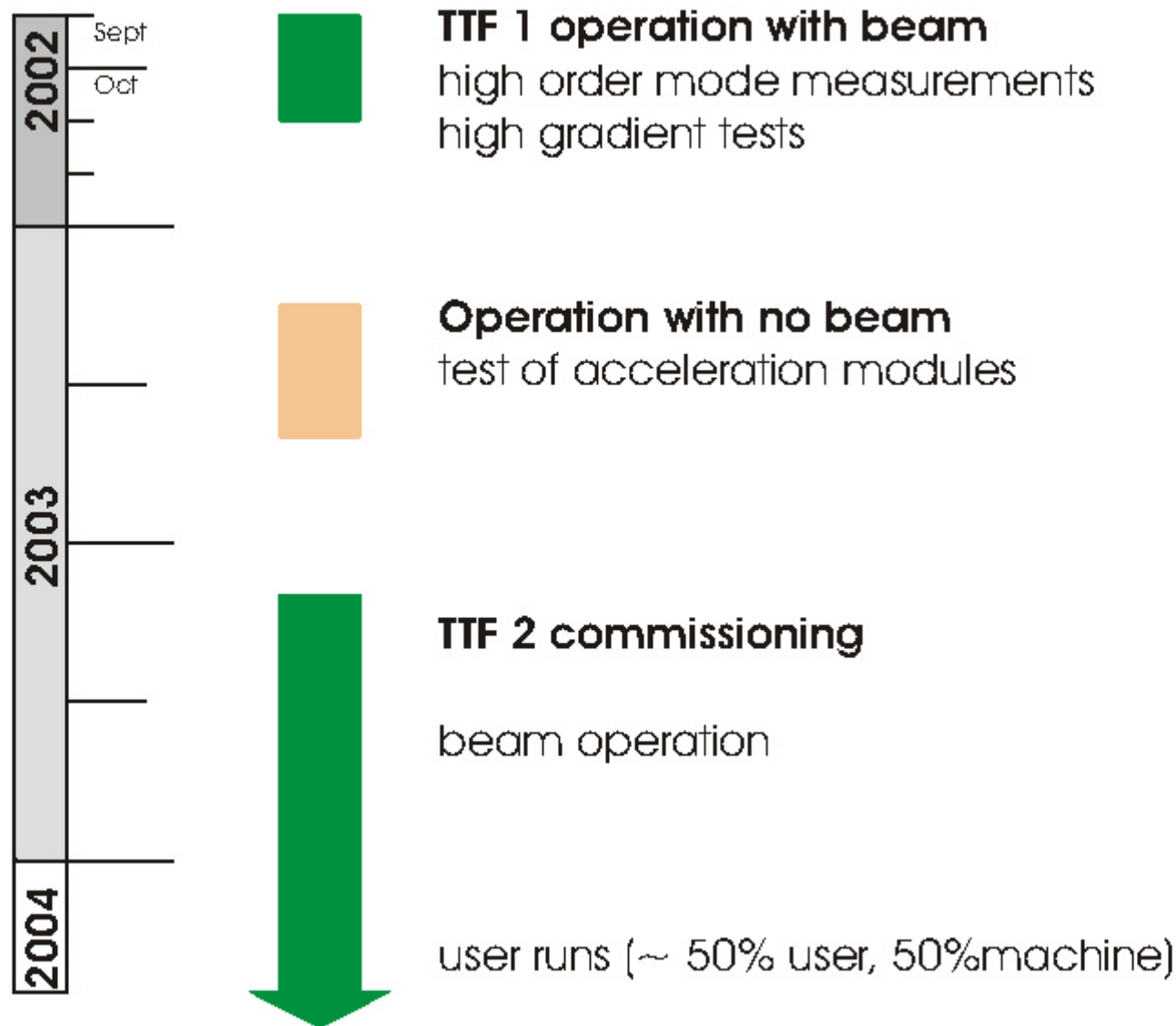 - for remote meetings (shift exchange, run coordination, design projects, GAN activities ..)

- e-logbook development as a core for further web based tools

  - first version of e-log available

  - fast changing technology

  - adapt more features

- .. more tools to come?

③

- Goal: provide all required information to the international team

- ToDo:
    - define the requirements
    - evaluate tools
    - find solutions for international info exchange
    - involve more (designers, operators..)
    - learn to use the tools and select/modify them
    - establish the tools in the daily work

Manuals   Parameters

Drawings   Diagrams

Schedules   Reports   Helps

Architectures   Error messages

Cables   Instructions

Task lists

Requirements   Minutes

④

2002	Sept
	Oct

TTF 1 operation with beam
high order mode measurements
high gradient tests

2003

Operation with no beam
test of acceleration modules

2004

TTF 2 commissioning

beam operation

user runs (~ 50% user, 50%machine)

④

- **Remote hardware:**

  One screen for the e-logbook (Netscape or IE)

  One screen for video conference (for common shifts)

  Two X-Window displays (e.g. LINUX)

  Fast internet connection

- **Operation experience**

  >= 1 month operation of the linac at TTF

- **Appointments with the TTF Run coordinator**

  Program

  Machine parameters

  ...

● **The goal is to better understand:**

    ● **social aspects**
learning to work in virtual teams
involvement, trust, commitment, responsibility .. of people

    ● **organizational aspects**
define and share responsibility, interfaces and tasks etc. in inter-
national projects

    ● **collaborative tools**
define, evaluate and use tools
involve more people from all special fields

    ● **technologies**
e.g. security, bandwidth/delay on Ethernet, Web ...

    ● **system aspects**
e.g. authorization, reliability, operability, integration ...

- **Start GAN more partnerships**

    - **Collaboration with Cornell and Ohio State: TTF Data AcQuisition System**

    - **...**

- **Do more remote shifts**

    - **TTF shifts/maintenance from Milano, Cornell, Paris ...**

- **Provide and use collaborative tools**

    - **video/audio for shifts and meetings**

    - **e-logbooks, information sharing ...**

- **Involve more people**